Questions 😀

1. What are conservative force ?

2. Explain how the work done against charge gets stored as potential energy?

3. Define electric potential energy difference between two points .

4. Why the concept of potential energy is path independent?

5. Define Potential energy of charge q at a point .

Work done by an external force in bringing a unit positive charge from infinity to a point = electrostatic potential (V) at that point.

6. Arrive at the result of potential at a point due to a point charge.

7. Draw Graph of E and V vs r for point charge.

8. Define dipole moment.

9. With the help of a diagram, show the quantities involved in the calculation of potential due to a dipole.

10. Potential at infinity is _____

11. Derive the expression for potential due to a dipole at a point in general.

12. Using above result, deduce the results for when the point is at equator or axis of dipole

13. Write the important contrasting features of electric potential of a dipole from that due to a single charge.

14. Write the expression for potential due to a system of charges using a diagram.

15. Draw equipotential surface for a
Point Charge, Line charge and plane sheet of Charge

16. What is equipotential Surfaces

17. Draw equipotential surface due to a dipole ,and due to two positive charges kept in vicinity

18. Explain relationship between electric field and potential using a diagram.

2.7 POTENTIAL ENERGY OF A SYSTEM OF CHARGES
2.8 POTENTIAL ENERGY IN AN EXTERNAL FIELD
2.9 ELECTROSTATICS OF CONDUCTORS

In metallic conductors, charge carriers are electrons.
Mechanism of conduction in metallic conductors : electrons are free within the metal but not free to leave the metal. The free electrons form a kind of 'gas'; they collide with each other and with the ions, and move randomly in different directions. In an external electric field, they drift against the direction of the field

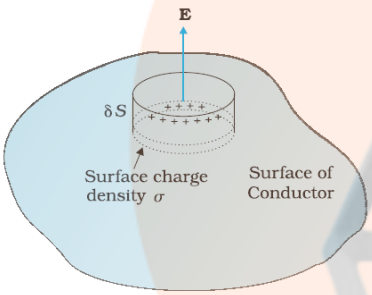
1. Inside a conductor, electrostatic field is zero
As long as electric field is not zero, the free charge carriers would experience force and drift. In the static situation, the free charges have so distributed themselves that the electric field is zero everywhere inside.

2. At the surface of a charged conductor, electrostatic field must be normal to the surface at every point

If E were not normal to the surface, it would have some non-zero component along the surface. Free charges on the surface of the conductor would then experience force and move. In the static situation, therefore, E should have no tangential component.

3. The interior of a conductor can have no excess charge in the static situation

Consider any arbitrary volume element v inside a conductor. On the closed surface S bounding the volume element v, electrostatic field is zero. Thus the total electric flux through S is zero. Hence, by Gauss's law, there is no net charge enclosed by S



4. Electrostatic potential is constant throughout the volume of the conductor and has the same value (as inside) on its surface

Since E = 0 inside the conductor, no work is done in moving a test charge within the conductor and hence the potential difference(PD) is 0, so the potential is same throughout.

5. Electric field at the surface of a charged conductor

$E = \sigma/\varepsilon$

6. Electrostatic shielding

any cavity in a conductor remains shielded from outside electric influence: the field inside the cavity is always zero. This is known as electrostatic shielding

Questions 😀

1. A 500 μC charge is at the centre of a square of side 10 cm. Find the work done in moving a charge of 10 μC between two diagonally opposite points on the square.

2. What is the electrostatic potential due to a point charge at a distance r from the charge?

3. What is the SI unit of electrostatic potential.

4. Write the potential energy due to a system of two charges separated by a distance.

5. Show how negative potential systems are attractive in nature.

6. Show how positive potential systems are repulsive in nature.

7. A point charge -Q is places at point O. Is V_a-V_b positive or negative?

8. Illustrate the potential energy due to a system of 3 charges.

9. Potential energy for a system of charges is _____ of the manner in which the configuration is assembled. (dependent/ independent)

10. Write the expression for Electric potential of two charge systems in an external electric field.

11. In above question, how will the expression change if the external field is removed?

12. Define 1 eV.

13. Derive the expression of potential energy of a dipole in an external electric field.

14. A comb run through one's dry hair attracts small bits of paper. Why?

15. Ordinary rubber is an insulator. But special rubber tyres of aircraft are made slightly conducting. Why is this necessary?

16. Vehicles carrying inflammable materials usually have metallic ropes touching the ground during motion. Why?

17. A bird perches on a bare high power line, and nothing happens to the bird. A man standing on the ground touches the same line and gets a fatal shock. Why?

18. Mention one use of electrostatic shielding.

19. Write dimensions of the following :
(i) Potential (ii) Capacitance (iii) Polarisation (iv) Dielectric constant

20. A spherical conductor of radius 12 cm has a charge of 1.6×10^{-7}C distributed uniformly on its surface. What is the electric field (a) inside the sphere (b) just outside the sphere (c) at a point 18 cm from the centre of the sphere?

2.10 DIELECTRICS AND POLARISATION
2.11 CAPACITORS AND CAPACITANCE
2.12 THE PARALLEL PLATE CAPACITOR
2.13 EFFECT OF DIELECTRIC ON CAPACITANCE

Questions 🙂

1. What happens to the free electrons of a conductor when it is placed in an external electric field?

2. What happens to a dielectric when it is placed in an external electric field?

3. Explain why is Carbon dioxide molecule non polar?

4. With diagram, explain the dipole moment in a water molecule?

5. Is HCl molecule polar?

6. Do non polar molecules develop an induced dipole moment when placed in an external electric field?

7. What are linear isotropic dielectrics ?

8. What is polarisation?

9. Why is the net dipole moment of a polar molecule zero in the absence of Electric field?

10. What happens when a polar molecule is kept in an external electric field?

11. Write the relation between P(polarisation) and E(ext electric field)

12. Define Capacitance.

13. Capacitance of a body depends upon its _____.

14. Define 1 Farad.

15. Explain leakage of a capacitor.

16. What is the breakdown voltage of air.

17. What is the electric field inside a capacitor of charge density σ

18. What is the potential difference across the plates of a capacitor of charge density σ

19. What is the electric field inside a capacitor of charge density σ and filled with a dielectric of dielectric constant K

20. What is the potential difference across the plates of a capacitor of charge density σ and filled with a dielectric of dielectric constant K

21. What is the capacitance of a capacitor of plate area A and distance between the plates d, filled with vacuum/air

22. What is the capacitance of a capacitor of plate area A and distance between the plates d, filled with a dielectric of dielectric constant K